

ANTI BIOTIC STEWARDSHIP IN INTENSIVE CARE UNITS

Rauf Jan & Khalid Rahman

Senior Registrar, Sheikh Zayed University Khost, Sheikh Zayed Teaching Hospital, Afghanistan

Received: 18 Jun 2020

Accepted: 23 Jul 2020

Published: 31 Jul 2020

ABSTRACT

Intensive Care Units (ICUs) place immense importance on antibiotic monitoring program endeavors in light of the fact that an enormous extent of any clinic's utilization of parenteral antibiotics, an explicitly wide range, occurs in the Intensive care units. Explicitly the criticalness of anti-microbial stewardship for fundamentally sick patients and the noteworthiness of risky consideration professionals as the critical edge for antibiotic stewardship, a workshop was conducted out to precisely deliver boundaries to antibiotic stewardship in the Intensive care units and examine procedures to overcome these. The operational meaning of antibiotic stewardship is "the correct medication at the ideal time and the correct dose for the correct infection for the specific timespan. The fundamental clearly identifiable value was that antibiotic stewardship ought to be a basic ability of basic consideration i.e. right dose, right direction and right time. The microorganisms that are not shielded by experimental antibacterial agents are a main output giving wide range treatment in fundamentally sick patients. Better diagnostics and result information can address this infection and extend endeavors to limit treatment. Better attention to the critical symptoms of anti-toxins ought to be underscored and is a significant expansive range treatment in remarkable satisfactory patients. Ideal antibacterial stewardship follow the right dose right direction and right dose consistence with rules. Then again, it should upgrade care both for severe ill patients (by improving and individualizing their decision of inhibiting bacterial infection). Possibilities for antibiotic stewardship in Intensive care units diseases, with network and medical clinic initiated serious infections like pneumonia and sepsis, are included. Medical clinician deals with emergency cases with antibiotic stewardship to treat pulmonary obstructions and improve consideration in the direction of right dose, right time and right direction.

KEYWORDS: Anti-Microbial Obstruction, Pneumonia, Sepsis Anti-Toxin Stewardship

INTRODUCTION

Antibiotic stewardship is the set of complete and strong strategy to get better the use of

Anti bacterial medications with the purpose of improving the outcomes of patient health, decrease the resistance to antibiotics and reduce the costs.¹

Improving the use of antibiotics in healthcare system to protect patients and reduce the danger of antibiotic resistance is a national priority.² The antibiotic action is an environmental pressure; those microorganism which have a mutation capability letting them show resistance to survive and to reproduce. They will then transfer this trait to their offspring, so that it will be a totally resistant generation. Recently collected surveys showed that the antibiotic resistance is increasing with the passage of time.³ Antibiotic resistance is increasing to dangerously excessive ranges in all parts of the world. New resistance mechanisms are growing and spreading globally threatening our capability to treat ordinary

infectious sicknesses.⁴ A growing list of infections which include blood poisoning, gonorrhea, tuberculosis, pneumonia, and foodborne sicknesses are becoming more difficult and every so often impossible to treat as antibiotics have emerge as less effective. Where antibiotics may be bought for human or animal use without a prescription, the emergence and unfold of resistance has increased.⁵ Similarly, on international level without extensive treatment protocols, antibiotics are regularly over-prescribed via medical examiner and veterinarians, and are more usually and over-used by the public.⁶ In US 23,000 deaths and in China 13,000 illness had been monitored in 2018 due to antibiotic resistance.⁷ In Afghanistan Carbapenem resistance has elevated. In the current time, it perverse into mentioned from special hospitals located at different locations in Pakistan that bacteria which causes specific infections have been turning into steadily resistant due to use of traditional antibiotics.⁸ In Afghanistan using antibiotic is unnecessarily high and due to over use of the medicine bacteria are getting resistance towards these antibacterial medicines. There are only a few reviews evaluating the antibiotic resistance in bacteria associated with special infections in Afghanistan. In general, the incidence of resistance to Novobiocin, Amoxicillin, Cofactor and Ampicillin had been from 62% to 75%.⁹ Multi drug resistance (MDR) is increasing in Afghanistan and it has been highlighted that it is observe that 77.5% of all of the screened isolates had been resistant to a few or greater than three of the examined antibiotics.¹⁰ Different reviews regarding the improvement of antibiotic resistance in Afghanistan verify the drastic enhancing of antibiotic resistance or maybe the improvement of MDR throughout the Afghanistan.

METHODS

The Acute Pneumonia Working Group of the Pulmonary Infections Assembly of the Medical practitioners in the beginning initiated a present for a Workshop on Antibiotic Stewardship within the Intensive Care Units patients. They arranged the workshop and invited different participants of the Intensive Care units Professionals Collaborative and the Centers for Disease Control and Prevention to participate, and each center sent representatives. Potential conflicts of interest were disclosed and managed according with the policies and processes. A multidisciplinary institution of 30 Pulmonary, Critical Care, Surgery, Infectious Diseases, Nursing, and Critical Care Pharmacist practitioners participated within the workshop, which was held in October 16, 2019 with the collaboration of many teaching institutes. The first and main focus was to pick out issues and understand possibilities for antibiotic stewardship focused toward male or female patients by using ICU clinicians at the bedside. Further information concerning the workshop are protected inside the on line supplement. As recommended via workshop members, the operating definition of antibiotic stewardship is “the right drug at the proper time with the proper dose for the proper contamination for the proper duration.” Implicit in this definition is that stewardship includes significantly greater than antibiotic reduction or discontinuation. Throughout the discussions, medical consequences remained the primary problem; with the right dose antibiotics prescribed for one patient can also have deleterious results on different patients. This running definition of antibiotic stewardship did now not consist of the phrases “at the proper price” it includes right dose. However, the members selected to keep using this more preferred terminology while emphasizing the breadth of difficulties involved.

Antibiotic Resistance Major Causes

- High dose of antibiotics prescription
- High dose prescription of antibiotics in Respiratory diseases
- Self-Medication

- Use of antibiotics in improper Duration
- Antibiotic sensitivity
- In health care settings deprived infection control
- Poor sanitation and hygiene system
- lack of new research on antibiotics
- Nutritional Crises
- Less trained doctors, nurses and no team work
- Quacks¹¹

Actions Required Preventing Resistance to Antibiotic

Antibiotic resistance is increased by using the misuse and overuse of antibiotics, in addition to serious infection prevention and manage. Steps may be taken in any respect tiers of society to reduce the effect and restriction the spread of resistance.¹²

Individual Responsibility

To stop and have power over the increase of the resistance to antibiotics, persons can

- Only use antibiotics when prescribed by a certified health professional.
- Always follow your health worker's advice when using antibiotics
- Never share or use leftover antibiotics.
- Prevent infections through frequently washing hands, preparing food hygienically, keeping off near contact with ill humans, practicing more secure intercourse and follow-ups of vaccinations updated.
- Prepare food hygienically, preserve easy and raw meals separate, hold meals at safe temperatures, use smooth filtered water for cooking, pick meals that have been produced without the use of antibiotics for growth promoting or ailment prevention in healthy animals.¹³

Policy Makers

To stop and have power over the increase of the resistance to antibiotics, policy maker can

- Make sure a nationwide plan to deal with the resistance of antibiotics.
- Get better observation of resistant of antibiotics against infections.
- Build policies, program and accomplishment of infectivity preventive and Control dealings.
- Standardize and promotion of the suitable use and discarding of quality antibiotics medicines.
- Make accessible on the impact of resistance against antibiotics.¹⁴

Health Professionals

To stop and have power over the increase of the resistance to antibiotics, health professionals can:

- Prevent infections via making sure your palms, gadgets and surroundings is easy.
- Only prescribe and dispense antibiotics whilst they may be prescribed, in line with possible disease condition.
- Report antibiotic-resistant infections to surveillance teams.
- Guide the patients about the way to take antibiotics successfully, antibiotic resistance and the dangers of misuse.
- Guide the patients approximately stopping infections (as an instance, vaccination, hand washing, more secure sex, and protecting nose and mouth when sneezing)¹⁵

Healthcare Industry

To stop and have power over the increase of the resistance to antibiotics, the health industry can:

- Empower in investigate and progress of new antibiotics, vaccines, diagnostics and Other tools.
- Must Acquire Microbiology support.
- Breakdown the chain of infections and promote infection control practices.
- Optimize the procedure of prescribing antibiotics.
- Promote evidence based practices.
- Administrative check and balance on the usage of antibiotics.^{16,17}

Diagnostic Stewardship

Diagnostic stewardship is referred coordinated direction and intervention to enhance appropriate use of microbiological diagnostics to guide therapeutic selections. It should be suitable, timely diagnostic testing, including specimen series, and pathogen identity and accurate timely reporting of consequences to manual affected person treatment.¹⁸

The major purposeof antibacterial diagnostic stewardship is to deliver:

- Patient control guided through timely microbiological facts to supply more secure and more powerful and effective patient care.
- Accurate Antimicrobial Resistance (AMR) surveillance statistics to inform treatment protocols.
- AMR manage strategy.

The Diagnostic Pathway

The diagnostic pathway starts offevolved while the affected person provides at the fitness-care facility. It covers the preliminary interplay between the patient and clinicians and different frontlinehealth-care employees providing care and responsible for diagnostic sampling, via to the function of the laboratory group of workers accountable for processing the pattern and reporting the consequences back to the clinician. The diagnostic pathway comprises of following steps

- Sampling collection and setting
- Turnaround time
- storage space and convey
- synopsis of pre-analytical sampling organization at point of care
- Laboratory giving out and process
- comments and coverage of result

Roles and Responsibilities

The duty for delivering in exact microbiological diagnostic services is shared similarly across scientific and laboratory body of workers on the surveillance website. Both groups have key roles to play inside the system. The implementation of diagnostic stewardship at surveillance websites requires a multidisciplinary team technique as well as institutional dedication which include the allocation of suitable human, economic and logistic resources. The multidisciplinary group ought to be mandated by the leading management to enforce diagnostic stewardship activities at the surveillance site and have to document reported on a everyday basis¹⁸

The aim to include the representation of

- Medical personnel
- laboratory personnel
- Surveillance Epidemiological personnel

Antimicrobial Resistance (AMR)

Antimicrobial resistance occurs whilst microorganisms (including bacteria, fungi, viruses and parasites) change while they're exposed to antimicrobial tablets (along with antibiotics, antifungals, antivirals, antimalarial and anthelmintic). Microorganisms that developed antimicrobial resistance are now and again known as "Antibacterials. As a result, the drugs end up useless and infections persist within the frame growing the threat of unfold to others. Antimicrobial resistance (AMR) threatens the powerful prevention and treatment of an ever-increasing variety of infections resulting from micro organism, parasites, viruses and fungi. AMR is a more and more serious hazard to worldwide public health that requires movement across all authorities sectors and society. Without effective antibiotics, the achievement of essential surgical procedure and most cancers chemotherapy might be compromised.¹⁹

The value of fitness care for sufferers with resistant infections is better than take care of sufferers with non-resistant infections due to longer length of contamination, extra tests and use of more high-priced pills. In 2016, 490000 humans evolved multi-drug resistant TB globally, and drug resistance is starting to complicate the fight towards HIV and malaria as properly.¹⁹

Antimicrobial Stewardship Program

Antimicrobial stewardship is coordinated software that promotes the perfect use of right antimicrobials (together with antibiotics), improves patient effects, reduces- microbial resistance, and decreases the spread of infections resulting from multidrug resistant organisms.

Basic Interventions in AMS Program

- Right indication
- Right drug (standard drug for long time period)
- Right delivery route
- Right dose (dosing in critically ill patient- Loading dose to an extended infusion)
- Right duration

Purpose of Microbiology Labs in AMS Programs

Microbiology laboratories play vital role in antimicrobial stewardship at the level of human being patients and the population as a whole. When empiric therapy has been started, rapid results can lead to earlier targeted treatment. Accumulated results of susceptibility tests can be analyzed and used to generate local or national guidelines on empiric treatment and prophylaxis. Several methods can be used to determine microbial identity and antimicrobial susceptibility, including traditional culture-based methods and newer molecular methods such as “Matrix-Assisted Laser Desorption Ionization Time-of Flight” and whole Genome Sequencing. These methods and potential advantages are reviewed before results, and are reported, expert rules are applied and results are edited. At this point the laboratory can influence prescribing practices.²⁰

Molecular Methods

- Antigen test
- Amplification test
- Mass spectrometry
- Broad range PCR
- Antibiotics to test and to report
- Cascade reporting of tested antibiotics
- Selective reporting
- Publishing annual or periodic cumulative susceptibility data
- Rapid reporting of positive and negative tests

Awareness Regarding Infection Control Program (ICP)

- CSSD management
- Personal hygiene
- House Keeping
- Medical waste management
- Implementation of ICP in hospitals and schools

Role of IP in Healthcare Settings

- Surveillance
- Collect
- Interpret
- Present

Support System of IPC

Consists of

- Surveillance techniques
- Surveillance technologists

Key Strategies Adapted by IP Team

- Obtain Correct antibiotic Information
- Antibiotic Route
- Reverse antibiotic therapy
- Reconcile antibiotic susceptibility and testing

Centers for Disease Control (CDC) Recommendations

- Accountability
- Drug Expertise

AMS programs are endorsed by doctors, nurses, pharmacists and all healthcare professional on national and international level.²⁰

REFERENCES

1. *The President's Council of Advisors on Science and Technology. Report to the President on combating antibiotic resistance.* September 2014 [accessed 2020 Apr 12]. Available from: https://www.cdc.gov/drugresistance/pdf/report-to-the-president-on-combatingantibiotic_resistance.pdf
2. Vincent JL, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, et al.; EPIC II Group of Investigators. International study of the prevalence and outcomes of infection in intensive care units. *JAMA* 2009; 302: 2323–2329.
3. Tabah A, Koulenti D, Laupland K, Misset B, Valles J, Bruzzi de Carvalho F, et al. Characteristics and determinants of outcome of hospitalacquired bloodstream infections in intensive care units: the EUROBACT International Cohort Study. *Intensive Care Med* 2012; 38: 1930–1945.

4. Steinberg M, Dresser LD, Daneman N, Smith OM, Matte A, Marinoff N, et al. A national survey of critical care physicians' knowledge, attitudes, and perceptions of antimicrobial stewardship programs. *J Intensive Care Med* 2016; 31:61–65.
5. Kollef MH, Micek ST. Antimicrobial stewardship programs: mandatory for all ICUs. *Crit Care* 2012; 16:179.
6. Decker B, Masur H. Bad bugs, no drugs: are we part of the problem, or leaders in developing solutions? *Crit Care Med* 2015; 43: 1153–1155.
7. IDSA Sepsis Task Force. Infectious Diseases Society of America (IDSA) position statement: why IDSA did not endorse the Surviving Sepsis Campaign guidelines. *Clin Infect Dis* 2018; 66:1631– 1635.
8. Broom J, Broom A. Guideline relevance, diagnostic uncertainty, fear and hierarchy: intersecting barriers to antibiotic optimization in respiratory infections. *Respirology* 2018; 23:733–734.
9. Charani E, Castro-Sanchez E, Sevdalis N, Kyratsis Y, Drumright L, Shah N, et al. Understanding the determinants of antimicrobial prescribing within hospitals: the role of “prescribing etiquette”. *Clin Infect Dis* 2013; 57:188–196.
10. Society for Healthcare Epidemiology of America; Infectious Diseases Society of America; Pediatric Infectious Diseases Society. Policy statement on antimicrobial stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS). *Infect Control Hosp Epidemiol* 2012; 33:322–327.
11. Kadri SS. Recognizing the unique role of critical care providers in confronting antimicrobial resistance. *Am J Respir Crit Care Med* 2018; 198:560–562.
12. Vincent JL, Bihari DJ, Suter PM, Bruining HA, White J, Nicolas-Chanoin MH, et al.; EPIC International Advisory Committee. The prevalence of nosocomial infection in intensive care units in Europe. Results of the European Prevalence of Infection in Intensive Care (EPIC) study. *JAMA* 1995;274:639–644.
13. Orsini J, Mainardi C, Muzylo E, Karki N, Cohen N, Sakoulas G. Microbiological profile of organisms causing bloodstream infection in critically ill patients. *J Clin Med Res* 2012;4:371–377.
14. Adrie C, Garrouste-Orgeas M, Ibn Essaied W, Schwebel C, Darmon M, Mourvillier B, et al.; OUTCOMEREA Study Group*. Attributable mortality of ICU-acquired bloodstream infections: impact of the source, causative micro-organism, resistance profile and antimicrobial therapy. *J Infect* 2017;74:131–141.
15. McKenzie MS, Auriemma CL, Olenik J, Cooney E, Gabler NB, Halpern SD. An observational study of decision making by medical intensivists. *Crit Care Med* 2015;43:1660–1668.
16. Vardakas KZ, Voulgaris GL, Maliaras A, Samonis G, Falagas ME. Prolonged versus short-term intravenous infusion of antipseudomonal b-lactams for patients with sepsis: a systematic review and meta-analysis of randomised trials. *Lancet Infect Dis* 2018;18:108–120.

17. Weiss CH, Moazed F, McEvoy CA, Singer BD, Szleifer I, Amaral LA, et al. Prompting physicians to address a daily checklist and process of care and clinical outcomes: a single-site study. *Am J Respir Crit Care Med* 2011; 184:680–686.
18. Fleming D, Ali KF, Matelski J, D'Sa R, Powis J. When antimicrobial stewardship isn't watching: the educational impact of critical care prospective audit and feedback. *Open Forum Infect Dis* 2016;3:ofw115. 19 Kumar A, Ellis P, Arabi Y, Roberts D, Light B, Parrillo JE, et al.; Cooperative Antimicrobial Therapy of Septic Shock Database Research Group. Initiation of inappropriate antimicrobial therapy results in a fivefold reduction of survival in human septic shock. *Chest* 2009;136:1237–1248.
19. Broom J, Broom A, Plage S, Adams K, Post JJ. Barriers to uptake of antimicrobial advice in a UK hospital: a qualitative study. *J Hosp Infect* 2016;93:418–422.
20. Braykov NP, Morgan DJ, Schweizer ML, Uslan DZ, Kelesidis T, Weisenberg SA, et al. Assessment of empirical antibiotic therapy optimisation in six hospitals: an observational cohort study. *Lancet Infect Dis* 2014;14:1220–1227.

